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The STAR Event Plane Detector

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The Beam Energy Scan (BES) program of the Relativistic Heavy Ion Collider(RHIC) is an exploration of the QCD phase diagram to find signatures of the critical point and the Quark-Gluon Plasma to hadron gas phase transition. For the Solenoidal Tracker at RHIC(STAR) a quantitative understanding of these signals requires an increase in statistics for 7, 11, 14, and 19GeV AuAu collisions as well as dedicated hardware upgrades.

The Event Plane Detector (EPD) is a proposed high η ($2.1 < |\eta| < 5.0$) detector that would replace the STAR Beam Beam Counter for BES phase II, which is scheduled to begin in 2019. The EPD would provide improved triggering, increased detector coverage in jet-like η-φ correlation measurements, improved resolution for event plane determination independent of the TPC($|\eta| < 1$), and provide a TPC independent centrality definition. Event plane and centrality determination from the TPC via a forward detector is crucial for correlation measurements performed at mid-rapidity.

The EPD design consists of two scintillator discs at ± 3.75m, each separated into 384 tiles(24 azimuthal sectors, 16 radial segments). Each tile has an embedded wavelength shifting fiber coupled to a clear fiber outside of the tile which is, in turn, coupled to a silicon photomultiplier(SiPM) –an inexpensive and magnetic field insensitive replacement for traditional phototubes.

A pre-prototype of the detector, featuring scintillator with embedded fibers coupled to SiPMs was integrated into STAR during the 2015 run. Tile designs varying geometry and detector specifications have been tested along with the latest generation SiPMs. Additionally, simulations have been performed to optimize tile η/φ segmentation, size, and shape. A newly machined prototype featuring the anticipated geometry of the EPD has been put in place for the 2016 STAR run and is sucessfully collecting data. Further work for the construction of the EPD includes prototype data QA, epoxy radiation hardness tests, electronics design and support structure fabrication. Applications of the detector for the BES II phase, results from the R&D phase, and the final design will be presented.

On behalf of collaboration:

STAR

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